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FERROCEMENT PRODUCED WITH POLYMER MODIFIED SILICA FUME CONCRETE

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ABSTRACT

The main objective of the paper is to study the Near Surface Characteristics of the Ferrocement produced with Polymer Modified Silica Fume Concrete. The Methodology adopted here is Ferrocement meshes and3% of Polymer is added and replacement of cement is done by silica fume from 5 to 30 % in 5 percent intervals. Cubes are casted and tested for Water Absorption and Sorptivity. The Conclusion obtained is at 15% optimum the Water Absorption and Sorptivity results are high.

KEYWORDS: Silica Fume Concrete, Polymer & Ferrocement

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Original Article

INTRODUCTION

Polymer Concrete is addition of Polymer material in the concrete to reduce the number of voids and to add good strength to the concrete. Styrene Butadiene Rubber Latex is a kind of polymer which is used in the mixing of the concrete mixture. It in turn helps in the increase in the properties of the concrete. Urethanes, Acrylics, Styrene butadiene resins, Vinyl, Epoxies are the different types of polymer materials used in the manufacturing of different types of Polymer Concrete.

Preparation of Mix

The manufacturing of Polymer Concrete is done by mixing Cement, Fine Aggregate, Coarse Aggregate, Water and Polymer, Welded wire Mesh and Chicken wire Mesh are used here and cages are been prepared according to the requirement of the specimen. The calculation of the materials was done using IS 10262-2019 Code Book. And the quantity of materials was mixed according to the proportion.

Experimental Procedure

Near Surface Characteristic Tests

Water Absorption and Sorptivity Test are conducted to know the optimum value of the properties of concrete.

Water Absorption Test

Cubes of 150 x 150 x 150 mm were casted and demoulded after 24 hrs and dry weight is taken as W1 after drying the specimens are kept in water for 24hrs, after 24hrs the cube specimens are taken out, dried and again the weight is noted as W2. The Water Absorption of the specimen is calculated as:

Percentage water absorption = $(W_2 – W_1)/W_1 \times 100$

Table 1

Sl. No	Description	Water Absorption (%)
1	C+FA+CA+W	0.84
2	C+FA+CA+W+1LM	0.87
3	C+FA+CA+W+2LM	0.89
4	C+FA+CA+W+P	0.90
5	C+FA+CA+W+P+1LM	1.02
6	C+FA+CA+W+P+2LM	1.19
7	C+FA+CA+W+P+5%SF	0.98
8	C+FA+CA+W+P+1LM+5%SF	1.20
9	C+FA+CA+W+P+2LM+5%SF	2.62
10	C+FA+CA+W+P+10%SF	0.86
11	C+FA+CA+W+P+1LM+10%SF	1.03
12	C+FA+CA+W+P+2LM+10%SF	2.63
13	C+FA+CA+W+P+15%SF	1.17
14	C+FA+CA+W+P+1LM+15%SF	1.25
15	C+FA+CA+W+P+2LM+15%SF	2.44
16	C+FA+CA+W+P+20%SF	0.90
17	C+FA+CA+W+P+1LM+20%SF	1.05
18	C+FA+CA+W+P+2LM+20%SF	1.13
19	C+FA+CA+W+P+25%SF	0.95
20	C+FA+CA+W+P+1LM+25%SF	1.18
21	C+FA+CA+W+P+2LM+25%SF	1.28
22	C+FA+CA+W+P+30%SF	1.09
23	C+FA+CA+W+P+1LM+30%SF	1.15
24	C+FA+CA+W+P+2LM+30%SF	1.33

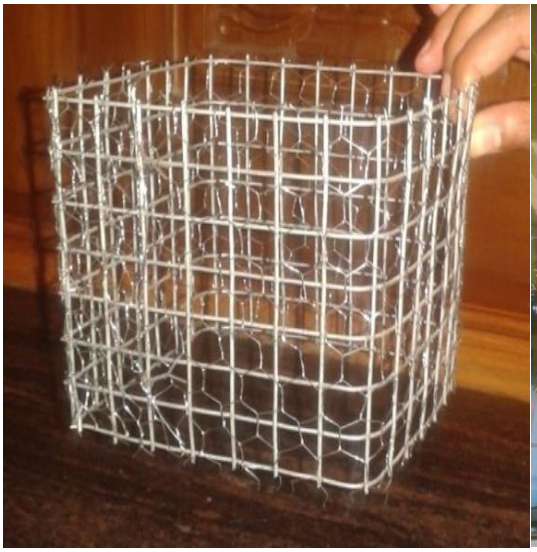

Figure 1: Mesh Bending for Cube.

Figure 2: Water Absorption for Cubes.

Figure 3: Cubes Kept in Water for 24hrs Curing.

Figure 4: Weighing of Specimen after Drying.

Sorptivity Test

Sorptivity test is found to be easy and quick test to measure the material properties that characterize the tendency to absorb and transmit water by capillarity. The test is conducted as follows,

- The cube specimens were placed in the tray such that they rest on a roller support. Water is poured into the tray such that the lower 30mm surface of the specimen is submerged in water. The increase in the level of watermark is determined for every five minutes till the saturation point is reached.

  $$S = i / t^{0.5}$$

  Where,

  S = Sorptivity in $mm/min^{0.5}$

  i = Depth of water level increase by capillary action, expressed in mm.

  t = Time measured in min. at which the depth is determined.

Figure 5: Sorptivity Test Set – Up.

Figure 6: Cubes on Roller Support.

Figure 7: Specimens in Water

Figure 8: Measurement of Capillary Rise of Water.

Table 2

Sl. No	Description	Sorptivity (mm/min^0.5)
1	C+FA+CA+W	0.237
2	C+FA+CA+W+1LM	0.273
3	C+FA+CA+W+2LM	0.292
4	C+FA+CA+W+P	0.273
5	C+FA+CA+W+P+1LM	0.310
6	C+FA+CA+W+P+2LM	0.456
7	C+FA+CA+W+P+5%SF	0.2
8	C+FA+CA+W+P+1LM+5%SF	0.319
9	C+FA+CA+W+P+2LM+5%SF	0.329
10	C+FA+CA+W+P+10%SF	0.319
11	C+FA+CA+W+P+1LM+10%SF	0.365
12	C+FA+CA+W+P+2LM+10%SF	0.41
13	C+FA+CA+W+P+15%SF	0547
14	C+FA+CA+W+P+1LM+15%SF	0.57
15	C+FA+CA+W+P+2LM+15%SF	0.639
16	C+FA+CA+W+P+20%SF	0.365
17	C+FA+CA+W+P+1LM+20%SF	0.456
18	C+FA+CA+W+P+2LM+20%SF	0.502
19	C+FA+CA+W+P+25%SF	0.365
20	C+FA+CA+W+P+1LM+25%SF	0.41
21	C+FA+CA+W+P+2LM+25%SF	0.456
22	C+FA+CA+W+P+30%SF	0.456
23	C+FA+CA+W+P+1LM+30%SF	0.502
24	C+FA+CA+W+P+2LM+30%SF	0.547

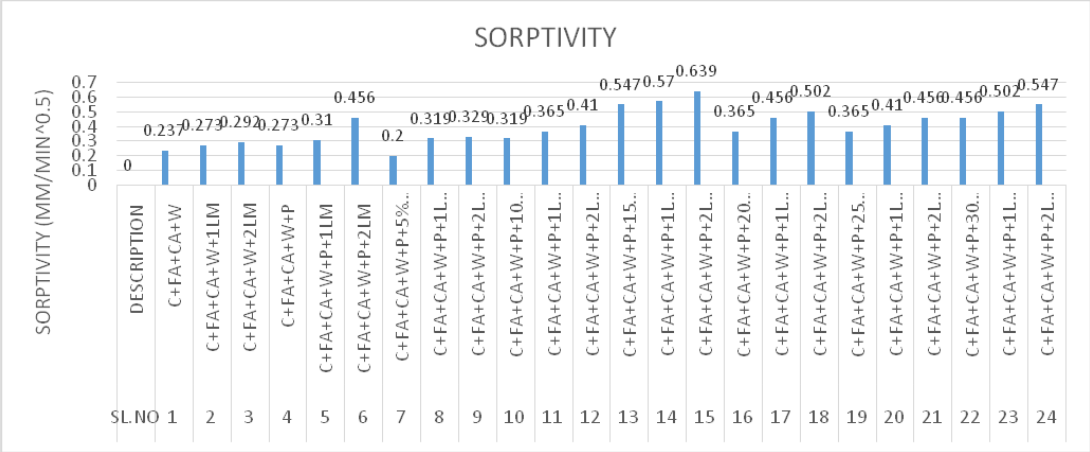

Figure 9

CONCLUSIONS

The Water Absorption and Sorptivity gave the peak results at 15% replacement of cement with silica fume and with the addition of 3% Polymer. When silica fume is added in more percentage, there will be reduction in the percentage of Water Absorption and Sorptivity.

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